the soil, not one of them flowing as far as the Hoang-ho" ('Mongolia,' 2, 11–12).

In comparing the Yellow river with the Yangtse, we cannot fail to be struck by the great natural provision against floods which the latter river enjoys in the immense reservoirs of the T'ung-ting and Poyang lakes. Equally strong is the feeling that it is the absence of such provision which makes the Yellow river a curse instead of a blessing to the low lands which it traverses on its way from the mountains to the sea. If this can be furnished by artificial aid supplementing the natural resources which seem to present themselves for utilization in north Ordos, the gain to China must necessarily be immense.

But I write as a layman who has no engineering knowledge and no personal acquaintance with the country under review, and solely in the hope of directing attention to it, if possibly some good may outcome.

SOME CARTOGRAPHICAL DOCUMENTS OF THE AGE OF GREAT DISCOVERIES.

By EDWARD HEAWOOD, M.A.

Such has been the impetus given, within recent years, to the facsimile reproduction of early maps, that the student may hope soon to be in possession of all the most important documents of the kind, brought out, too, in a style very different from that with which an earlier generation had to rest content. Dr. Ravenstein's monograph on 'Martin Behaim and his Globe,' * accompanied by a full-size coloured reproduction of the latter in gores, is a fitting crown to a life of activity in the cause of geography. Many as have been the author's previous contributions in this field, there is none which brings out so forcibly alike his wide range of information and his critical judgment in dealing with his material. It is fitting that these qualifications should have been brought to bear on one of the most interesting cartographical questions of the fifteenth century, and one in regard to which students have hitherto had to depend on but imperfect aids. The globe and its history, as well as that of its author, have now for the first time met with adequate treatment, and such is the thoroughness with which the task has been performed, that Dr. Ravenstein's study, if not the last word on the subject, must always remain the foundation on which all future work must be built.

The reproduction of a globe-map must always present greater obstacles than that of a plane-map, and in the case of Behaim's globe the destructive work of time has added to the difficulty, and is no doubt

* 'Martin Behaim: His Life and his Globe.' By E. G. Ravenstein. With Facsimile, Maps, and Illustrations. London: G. Philip & Son. 1908. Price £3 3s.

a reason why the execution of the task has been so long delayed. An exact photographic reproduction was, of course, out of the question, but though, as Dr. Ravenstein allows, his copy is not a facsimile in the strictest sense of the word, the care bestowed on its preparation has certainly given us the nearest possible approach to a facsimile. Fortunately for the object in view, the replica made at Jomard's suggestion, in 1847, for the National Library at Paris, has proved, on comparison with the original, to be on the whole an exact and trustworthy copy. Tracings and photographs of this have therefore served Mr. Ravenstein as the basis of his own copy. But he has by no means blindly followed his pattern, but by careful collation with the original globe has introduced corrections which bring us far nearer to that original than any version yet supplied. To recover all the features of the globe as at first made is not to be thought of, the misguided efforts of renovators having caused many of the original readings to be hopelessly lost, and evident corruptions, both of sense and orthography, cannot be eliminated. But Dr. Ravenstein has done all that was humanly possible, and we can only admire the skill and perseverance with which the corrupt and voluminous legends have been puzzled out and reproduced in legible form. A word of praise must also be given to Messrs. Philip for their enterprise in deciding to reproduce the full colouring of the original—a matter of great expense, which they can hardly hope to recover; and to Mr. Griggs, whose well-known skill in colour lithography has never before been better exhibited.

But before speaking of the globe itself and its sources as elucidated by the author, something must be said on the section dealing with Behaim's life and achievements. So much ill-judged and even dishonest panegyric has been bestowed in the past on the Nuremberg cartographer, that, in spite of the excellent contribution of so careful a writer as Dr. S. Günther, much research was necessary in order to show the subject of the memoir in his true character. Dr. Ravenstein has spared no pains to arrive at a true verdict by a study of the whole literature bearing on the question, and he renders a valuable service in the impartial way in which he discriminates between the unsupported guesses of previous writers and the facts which rest on a sure basis. We cannot follow him as he traces the fortunes of Behaim, from his early mercantile life at Nuremberg or in Flanders, to his later career at Lisbon and the Azores, but a few special points may be referred to. One of these is the part played by Behaim in the "Junta dos Mathematicos" appointed by King John II. of Portugal in 1484 or 1485. His claims as a practical astronomer are subjected to a rigorous examination, and it is conclusively shown that they rest on an extremely slight foundation. Even if Behaim had in early years been a pupil of the astronomer Regiomontanus, he had profited little by the instruction received, while the claims made on his behalf that he introduced the use of the astrolabe, cross-staff, or

declination tables, into Portugal, are quite untenable. All that can be said is that he may have *imported* nautical instruments into that country, though even this is a mere guess. Still more important is the question of Behaim's claim to have accompanied Cão on one of his voyages to the Congo, in connection with which Dr. Ravenstein deals fully with the history of contemporary voyages on the west coast of Africa. The evidence against the claim certainly seems all but conclusive, at least if the dates given by Behaim are correct. On the other hand, it is not denied that some traces of a knowledge of West Africa are to be found in Behaim's accounts, but these are quite compatible with the idea that he took part in a less extended voyage, probably that of João Affonso d'Aveiro to Benin in 1484–85. The knighthood conferred on him by King John in 1485 (according to a memorandum still preserved in the family archives, the accuracy of which Dr. Ravenstein sees no reason to doubt) may have been a reward for the part taken by him in such an expedition, or possibly for services against the Moors, if, indeed, it were not gained merely through personal interest, for he belonged to an old patrician family at Nuremberg. As regards the relations supposed to have existed between Behaim and Columbus or Magellan, it is shown that there is no likelihood that he influenced in any way the cosmographical notions of the former (though both held the same erroneous views as to the narrowness of the oceanic portion of the globe), or that any map of his can have guided Magellan to his strait, seeing that no known maps, constructed before Behaim's death (1507), give a hint at the existence of such a strait. The claims made on his behalf to the discovery of the New World are, of course, without the least foundation.

Turning now to the globe itself, the points of interest are so many that we can refer to the more important only. Dr. Ravenstein has been at immense pains to trace the sources, not merely in a general way, but in minute detail, each separate legend being reproduced and commented on. The whole is treated on an equal plan, just as much care being bestowed on the near as on the remoter regions. As might have been expected from so experienced a cartographer, Dr. Ravenstein helps to an understanding of the globe by an interesting series of sketch-maps, in one of which he shows, in correct outline, the world as known to Christian Europe in 1492, while in another he gives an outline sketch of Behaim's globe, distinguishing (1) those portions due to Ptolemy; (2) those based on Marco Polo; and (3) those derived from all other sources.* It brings out in the clearest way the preponderating influence of the two first, especially for the Mediterranean, North and East Africa, and the whole of Asia, with its islands. A great deal of information,

* In a third, he shows what sort of a picture of Eastern Asia might have been given by an intelligent map-maker of Behaim's time on the basis of Polo's travels. It is a forcible illustration of the slightness of Behaim's claim to be considered such.

from Portuguese sources, which might have been at Behaim's disposal, was not utilized at all. Some other authorities were used, and a comparison with other maps of the period (the Laon globe, the map of Henricus Martellus, and others) shows that as regards the continental outlines, the nomenclature of the coasts and interior of Africa, and some other details, we may trace the influence of a type of map of which the earliest examples are now lost. Dr. Ravenstein's acute deductions respecting such unknown sources are of special interest, and though all his efforts to trace the origin of the features in question have been fruitless, he has done a service by calling attention to the field for research which is open to students in this direction. He points out that if we were in possession of the materials at Behaim's command whilst he was at Nuremberg, we should find a solution for many questions which now puzzle us. There are three sections of special interest in this connection. In the region between the Euphrates and the Ganges Behaim introduces a nomenclature of his own, the origin of which is still an unsolved problem; while in Eastern Asia and Africa, although the main features are to be found in one or two other maps (especially Waldseemüller's of 1507), it is evident that a common though unknown original has been drawn upon in each case. In inner Africa many names now appear for the first time, though some are also to be found in the fictitious narrative of Ritter von Harff, whose travels, as Dr. Ravenstein ironically remarks, must have been made on the unknown map above alluded to. One of the names is the "Sacaff" which in one form or another appears so often in later maps as a designation of one of the Central African lakes. On the globe it now reads Saraff—in fact, Dr. Ravenstein seems disposed to accept this form, though on Waldseemüller's map of 1507 it is certainly Sacaff; and there are other cases of the conversion of an original *c* into *r*, as in *ritade* for *cidade*. He says that the name undoubtedly refers to Lake Tsana in Abyssinia, and this is likely enough, though we are left in the dark as to the origin of the name, which had made a previous appearance in literature as the "Saaph" of Berlinghieri's metrical version of Ptolemy (to which Dr. Ravenstein does not refer). The name seems to be here applied, not to one of the two Ptolemaic lakes, but to a *third* lake-source of the Nile.* Is it just possible that it may represent the plain of Sacala, spoken of later by Paez and Lobo in connection with the source of the Blue Nile?

The grotesque delineation of South-East Asia, common to Behaim and many other maps of the period, is another of the features probably derived from some lost prototype. Dr. Ravenstein refers to the great

* Dr. Ravenstein calls attention to the appearance of a third headstream in the Ulm Ptolemy of 1482, as probably derived from one of the unknown maps, and the reference to *three* lakes by Leonardi da Vinci (cf. January number, p. 79) may be referable to a similar source.

south-east peninsula as a duplication of India, but does not this too much convey the impression that it originated as a positive conception, instead of being (as seems to be the case) a last residuum of Ptolemy's representation of the Indian ocean as a closed basin, the eastward prolongation of Africa being due to a similar cause? The names attached to it, on the other hand, seem merely bestowed in the usual random way. The drawing of the chain of great islands is another common characteristic of the same group of maps, the nomenclature being almost entirely derived from Polo. Dr. Ravenstein has no doubt that Java Maior here refers to Borneo, though Yule (and apparently Cordier) accepts the identification with Java proper. For Necuram, on the other hand, he prefers the orthodox identification with one of the Nicobars to Schlegel's suggestion (cf. *Journal*, vol. 19, p. 754) that it stands for Nakur in Sumatra.

Many other points might be referred to, but limits of space forbid. The general result of the study is to show the maker of the globe in a very different light from that in which he is placed by his panegyrists, and its special value lies in the opportunity it gives for the first time of forming a just appreciation of Behaim's true place as a traveller and cartographer. From the latter point of view, his work was certainly not that of an expert, very little judgment having been shown by him in the selection and use of his material. But he by no means stands alone as an offender in this respect, and if we think of the circumstances of the time, we shall not be disposed to judge him by modern standards. Considering the small amount of discrimination shown by the modern public in the choice of maps, we can hardly wonder if the general public of those days was content with a more or less diagrammatic representation, however much the need of accurate charting was recognized by those concerned with nautical enterprise. From this point of view, one is tempted to ask whether too much weight is not often attached to minor variations in early printed maps, many of which may have been merely the result of chance. If it has been necessary to bring down Behaim from the pedestal on which he has been placed, the blame is to be laid on the misguided efforts of former biographers, for, as Dr. Ravenstein shrewdly remarks, probably no one would have been more surprised than Behaim himself at the posthumous fame which has attached itself to his memory.

Of a totally different type, though only ten years later in date, is the map drawn about 1502 (from Portuguese sources) by Nicolo de Canerio, of Genoa, of which an excellent facsimile has been brought out by Prof. Stevenson of Rutger's College, under the auspices of the American Geographical Society and the Hispanic Society of America.* This map —made known to students by Prof. Gallois in 1890, but now for the

* 'Marine World Chart of Nicolo de Canerio Januensis, 1502 (circa).' A critical study with facsimile by Edward Luther Stevenson, PH.D. New York: 1908. Price $20

first time completely reproduced in full size—is remarkable for the accurate way in which it portrays all the latest results of nautical discovery. Some account of the reproduction was given in the *Journal* for December last (p. 647), but it may here be spoken of somewhat more in detail.

The critical study which accompanies the map, besides giving a general description, discusses its several parts in turn, paying, however, much more attention to the New than to the Old World portion. The latter is, in fact, specially reserved for future discussion. Prof. Stevenson begins with the north-west section, where we find the results of Cortereal's voyage to Newfoundland shown in close proximity to the Greenland of earlier maps. This land seems, from the Portuguese flag at its southern end, to be considered as part of the discoveries of that voyage. In fact, in the closely similar Cantino chart, the statement is definitely made that it had been discovered by order of the King of Portugal; while in some later maps of the same type the name Labrador is assigned to it. It is not quite clear what is to be understood by Prof. Stevenson's remark that "doubtless the Labrador of the early maps was generally Greenland," but the association can hardly mean more than that the chartmakers, having laid down Newfoundland in close proximity to the Greenland of earlier maps, were content to let the latter do service for the Labrador coast. The statement of the Cantino chart, that this land was regarded as the extremity of Asia, leaves it doubtful whether the connection was supposed to be with the north-east or north-west of that continent. The analogy of Ruysch's map of 1508, referred to by the editor,* might suggest the former, but the only connection actually shown is that across the North Atlantic with the extreme north of Europe, this being also regarded as part of Asia.

The next land to the south of Newfoundland offers perhaps the most interesting problem of all, though, as Canerio's delineation is followed in other long-known maps, the question has often been discussed before. While Sir C. Markham, in his volume on Cortereal's voyages issued by the Hakluyt Society, made out a strong case for regarding this coast-line as that traced during Cortereal's second voyage (its proximity to the West Indies being merely due to the erroneous latitude assigned to the latter), Prof. Stevenson sees in it a result of early voyages to the Florida coast, of which the record has been lost. He is even inclined to find in it a confirmation of the general truth of Vespucci's statements regarding his "first" voyage, the fictitious character of which has again been argued with so much force by Sir

* In speaking of a manuscript copy of Ruysch's map, which he hopes to reproduce later, Prof. Stevenson would seem to refer to the copy by Glareanus in the set of maps described in this *Journal* for June, 1905; for it is hardly likely that two manuscript copies should have been brought to light almost simultaneously.

C. Markham in his edition of Vespucci's letters. No definite light is, however, thrown on the nomenclature of the coast, and the designation "Cavo doffim de Abull" for its south-east extremity harmonizes no better with the dates of Vespucci's supposed voyage than of others that are known to us.*

The nomenclature of the West Indies does not suggest any special problems, but it may be worth noting that, as in the Cantino chart, Jamaica is already established as the name of the island so known ever since. On the South American coast the nomenclature is particularly full (there being fifty-eight names as against the thirty-three of Cantino), and here we may accept Prof. Stevenson's conclusion that it is in great part derived from Vespucci's "third" voyage, though we find no indication of the rock-bound coast which that navigator claimed to have reached in about 52° S. A tabulation of the names on the Brazilian coast, evidently derived from saints' days,† with the respective dates of the latter, throws no very clear light on the probable chronology of Vespucci's voyage, for it must be remembered that the names do not appear on the chart in the chronological order followed in the table, while several at least of the names must be attributed to other voyagers. As Prof. Stevenson points out, at least eight well-authenticated visits to the Brazilian coast were made between 1498 and 1502. The most southerly name, Rio de Cananor, placed in about the highest latitude claimed by Vespucci to have been reached on this coast, is explained as derived from the feast of La Cananea.

The European section of the chart is passed over as not having been open to new discoveries in Canerio's day. This is hardly true of the northern parts, though the conventional nature of the representation of this part of the world (common to so many maps from early in the fourteenth century onwards) may justify the omission to consider it in detail. More attention is given to the coasts of Africa, but as the contemporary mapping of these coasts has been so carefully dealt with by Dr. Ravenstein in his 'Vasco da Gama' (to which suitable reference is made) and elsewhere, we may pass over this section very briefly. There is a sketch of the voyages which supplied the material for the map, as well as a useful comparative table of names as given by Pilestrina,

* Although the presumption might seem to be that this cape was reached by some navigator at the end of April, it is conceivable that the name is merely an allusion to spring-like weather experienced in its neighbourhood, the end of April being regarded as a turning-point of the year. Thus in the poem supposed to have been written in connection with the tragic death of Mary of Burgundy (the young wife of the Archduke Maximilian) in 1482, the author, La Marche, states that he had completed it—

"Sur la fin davril
que lyver est en son exil
et que leste fait ses explois."

† It is not quite clear why the *spelling*, as well as the location, of Sam Ioam should suggest "that by ioam Jorge may be meant."

Canerio, Cantino, and Waldseemüller (1516).* For the whole region east of Cape Guardafui the editor is content, for the present, to give a list of Canerio's legends. The absence of a commentary on this section, which offers points of interest hardly inferior to the American, is perhaps less to be regretted for the full attention given to it (in special relation to the Arabian sources drawn upon) by the late Prof. Tomaschek in his introduction to the 'Mohit' (*Journal*, vol. 11, p. 76), as well as in the recent work by Dr. Denucé spoken of below.

In a final chapter on the sources and influence of Canerio's map, Prof. Stevenson points out the main points of similarity or difference which it exhibits when compared with contemporary maps, and draws the conclusion that many now unknown charts, drawn by the actual participators in geographical discovery, were in existence in Canerio's day, and formed the basis of the compiled maps, which alone have come down to us. The reproduction of so important a document is a boon to students of early cartography, though it may be feared that the high price charged may put it beyond the reach of many.

In a work of more modest form,† though of considerable interest, Dr. J. Denucé carries the story of Portuguese cartography a step further—into the second decade of the sixteenth century. His special theme is the work of the Reinels (father and son), in regard to which the late Dr. Hamy's study, excellent as it was, left some room for further investigation. The map and atlas preserved in the National Library at Paris (which, though unsigned, may be safely attributed to them) have now for the first time been fully dealt with, and the result is to bring into clearer relief than previously the important services rendered by the Reinels to early sixteenth-century map-making. In an introductory section, Dr. Denucé traces the beginnings of Portuguese cartography in general, and in this the Canerio and Cantino charts naturally meet with full consideration, though attention is also given to the earlier sources (Italian, Catalan, etc.) at the disposal of Portuguese cosmographers of the period. Dr. Denucé may be thought to use the term "Portuguese cartography" in an unduly wide sense, for he deals with many maps that are not actually Portuguese. It seems hardly permissible to place in one main category of *Portuguese* maps the theoretic productions with which, in fact, Portuguese cartographers had less to do than most of their contemporaries. Behaim's globe, again, is hardly to be regarded as the direct fountain-head of subsequent productions of the theoretic type, as Dr. Denucé appears to consider it. He shows once or twice a leaning towards more or less heterodox views, such as those of Vignaud in regard to the relations of Toscanelli and Columbus; and he is surely

* In a similar comparative table for America, Waldseemüller's map of 1507 is included in place of Pilestrina's.

† 'Les origines de la Cartographie portuguaise et les cartes des Reinel.' Ghent: E. van Goethem. 1908. Price 10 *fr.*

not justified in saying that while Cantino's chart retains the "Sinus Magnus," in Canerio's this has given place to the ocean. But while exception may be taken to matters of detail, the author shows, on the whole, both judgment and knowledge in his handling of the subject.

In the second section, Dr. Denucé traces the life-history of the Reinels (so far as it can be made out), and the influence they exercised on the cartography of nations other than their own. In the third, the maps above alluded to are described and analyzed. They consist of a loose Portolano sheet, nearly 4 feet in length, and an atlas of four smaller sheets, the whole supplying a representation of all the then known world except Africa, which would seem, however, to have originally been included. They seem to have been drawn, about 1516, for the use of some member of the Portuguese Royal Family. All the sheets but one have designs on both sides of the parchment, the large sheet showing the Atlantic ocean on the recto and the Mediterranean on the verso. The former chart was discussed by Harrisse in his 'Terre Neuve,' but Dr. Denucé calls attention to some points overlooked by that writer. Of the four sheets of the atlas, two depict Europe and Brazil respectively (with the Azores on the verso of the first), while the others present a series of maps which, when put together, form a complete chart of the Indian ocean and surrounding lands, showing the Reinels' conception of the route to the Moluccas—in those days, no doubt, the chief matter of interest. It presents a remarkable combination of accurate nautical knowledge with theoretic geography; for though the Malay peninsula and islands are fairly well shown (for the time), the "Sinus Magnus" still figures in the Ptolemaic form, with its eastern coast-line stretching down to the southern border of the map.

Dr. Denucé gives photographic reproductions of the maps of the Atlantic and Brazil, and an outline sketch of the maps of the Indian ocean suitably pieced together, together with sketches of the Reinels' signed map of the same ocean (of 1517) and of the anonymous Munich map of 1520, which he does not consider as actually their handiwork. The character of the maps is, he thinks, to be explained by reference to the person of mark for whom the atlas seems to have been intended. The charts would, in fact, have been of little practical use to sailors, although based in the main on nautical data.

That the edition of the 'Islario' of Alonso de Santa Cruz,* brought out in connection with the Sixteenth Congress of Americanists, has been reserved for notice at the end of this article, does not imply any inferiority of interest, but that the later date of the original work places it in a somewhat different category from the publications already referred to. The document, now first printed in full, is, in fact, of the

* 'Die Karten von Amerika in dem Islario General des Alonso de Santa Cruz. Mit dem Spanischen Originaltexte und einer kritischen Einleitung herausgegeben von Franz R. von Wieser.' Innsbruck: Wagner. 1908.

highest importance for the history of American discovery and cartography. In a brief introduction, Prof. von Wieser points out the prominent place occupied by Santa Cruz among his contemporaries for the extent and many-sided character of his work. Of his contributions to geography, his map of 1542 has been available to students for some time, but the 'Islario'—a still more important work—has been dealt with only in fragments. It exists in three different manuscripts, two at Vienna, one at Besançon,* but none includes more than parts 3 and 4 of the work as originally planned, and it is probable that the design was never carried out as regards the first two.

It is the fourth part only that is now reprinted, with facsimiles of the original maps; but it is this part which has by far the most value by reason of its author's official position as cosmographer to the Spanish crown, and his personal share in American exploration. As regards the date, given by Navarrete as 1560, Prof. von Wieser shows good reason for placing it as early as 1541, a fact which adds considerably to the interest of the work. Although called an 'Islario,' the work (like others similarly named) does not confine itself to islands, but portrays almost the whole coast of America except the Gulf of Mexico. There is a plan of the city of Mexico, which bears a general likeness to the separate plan known from the same hand, but differs from those given by other authors. The fact that Santa Cruz took part in the Cabot expedition of 1526 to the La Plata gives a special interest to his delineation of this region, which we accordingly find shown with more accuracy and in greater detail than in other maps of the period. The names Rio de la Plata and Buenos Aires now make their appearance for the first time. A point to which the editor calls special attention is the marking, in the northern interior of South America, of the "Governacion de Los Belzares," no other map giving, it seems, any reference to the famous house of the Welsers. Some new details also appear in the region of the strait of Magellan.

Prof. von Wieser points out that this collection of maps is entitled to rank as the first special American atlas—a distinction which has previously been claimed (as by Prof. Grande, cf. *Journal*, vol. 29, p. 670) for Gastaldi's maps in the Ptolemy of 1548. A comparison of the two sets of maps, and, in general, of the 'Islario' with other contemporary documents, would have been interesting. But the editor, no doubt wisely, avoids a detailed examination of the subject-matter, which his publication will permit future students to make for themselves.

* The statement of Navarrete, that a fourth existed at Madrid, seems to have been incorrect.